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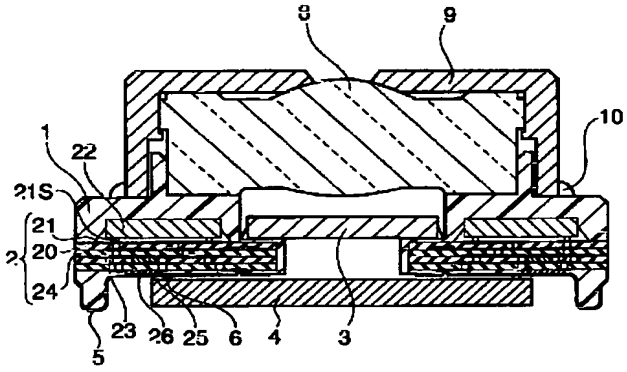
(54)【発明の名称】　固体撮像装置およびその製造方法

(57)【要約】
【課題】　周辺の接続回路を不要とし、製造工程の簡略化をはかるとともに小型でかつ信頼性の高い固体撮像装置を提供する。また、立体プリント基板などの構造体の熱変形を抑制し、固体撮像素子の接続を確実にするとともに、固体撮像素子の接着品質の向上をはかる。また、装置全体としての小型化および製造工程の簡略化をはかる。
【解決手段】固体撮像素子４に接続され、固体撮像素子４の装着される部分と透光性部材３の装着される部分との間に配置せしめられるように形成された回路基板２を一体的に封止した構造体１を用い、この貫通開口部１Ｃに固体撮像素子４を装着するとともに、固体撮像素子４から所定の間隔を隔てて貫通開口部１Ｃを塞ぐように透光性部材を装着したことを特徴とするもので、構造体の成型時に回路基板２を一体成型することにより、工数の低減をはかるとともに、装置の小型化を実現する。



【特許請求の範囲】
【請求項１】　絶縁性樹脂で構成され、貫通開口部を有する構造体と、
前記貫通開口部を塞ぐよう前記構造体に装着された固体撮像素子と、
前記固体撮像素子から所定の間隔を隔てて前記貫通開口部を塞ぐように前記構造体に装着された透光性部材と、
前記固体撮像素子に接続され、前記構造体の前記固体撮像素子の装着される部分と前記透光性部材の装着される部分との間に配置せしめられるように、前記構造体内に一体的に封止せしめられた回路基板とを具備したことを特徴とする固体撮像装置。
【請求項２】　前記回路基板は、前記固体撮像素子の装着される部分にその一部が露呈せしめられた導体パターンを有する多層配線基板であり、前記固体撮像素子は前記回路基板の前記導体パターンにフェースダウンで直接接続されていることを特徴とする請求項１に記載の固体撮像装置。
【請求項３】　前記回路基板は、前記固体撮像素子の出力信号を処理する信号処理回路を含むことを特徴とする請求項１または２のいずれかに記載の固体撮像装置。
【請求項４】　前記信号処理回路は前記回路基板の透光性基板装着側である第1の表面に接続されたチップ部品であることを特徴とする請求項３に記載の固体撮像装置。
【請求項５】　前記回路基板は、前記貫通開口部に相当する領域の一部を含み、前記貫通開口部に突出する透光性部材装着される部分をもつように貫通口を具備したリング状体で構成され、
前記回路基板の前記透光性部材の装着される部分に前記透光性部材が固着せしめられていることを特徴とする請求項１乃至４のいずれかに記載の固体撮像装置。
【請求項６】前記回路基板は、多層配線基板で構成され、前記固体撮像素子搭載面側にも導体パターンが露呈せしめられており、前記固体撮像素子が前記導体パターンに直接接続されていることを特徴とする請求項1乃至５に記載の固体撮像装置。
【請求項７】　前記構造体は、脚部と、前記脚部上に設けられた筒状の胴部とを有し、前記貫通開口部は前記胴部と前記脚部との間に配置せしめられていることを特徴とする請求項１乃至６のいずれかに記載の固体撮像装置。
【請求項８】　前記多層配線基板は前記脚部表面の一部に形成された導体パターンに電気的に接続されていることを特徴とする請求項７に記載の固体撮像装置。
【請求項９】　前記多層配線基板は前記絶縁性樹脂よりも熱膨張率の小さい材料で構成されていることを特徴とする請求項７に記載の固体撮像装置。
【請求項１０】　前記透光性部材は、石英ガラス表面に多層構造の誘電体薄膜を形成してなることを特徴とする請求項１乃至９のいずれかに記載の固体撮像装置。
【請求項１１】　前記透光性部材は、熱硬化性樹脂からなることを特徴とする請求項１乃至９のいずれかに記載の固体撮像装置。
【請求項１２】　前記透光性部材は、光学フィルタであることを特徴とする請求項１乃至１１のいずれかに記載の固体撮像装置。
【請求項１３】　前記回路基板は、透光性基板の表面にリング状をなすように形成された多層配線部からなり、前記透光性基板の中央部に位置する前記多層配線部から露呈する領域が、光学フィルタを構成していることを特徴とする請求項１２に記載の固体撮像装置。
【請求項１４】　中央部に貫通口を有する絶縁性基板を用意し、配線層を形成し、回路基板を形成する配線基板形成工程と、
前記回路基板の第1の表面上に信号処理回路チップを接続する工程と、
前記信号処理回路チップの接続された回路基板を覆うとともに、前記貫通口に相当する領域に貫通開口部を形成するように絶縁性樹脂で封止し、構造体を形成する構造体成型工程と、
前記回路基板の第２の表面に前記構造体の前記貫通開口部を塞ぐように固体撮像素子を装着する固体撮像素子装着工程と、
前記回路基板の第1の表面に透光性部材を装着する透光性部材装着工程とを含むことを特徴とする固体撮像装置の製造方法。
【請求項１５】　前記構造体成型工程は、熱可塑性の絶縁性樹脂からなる構造体を、射出成型によって形成する射出成型工程であることを特徴とする請求項１４に記載の固体撮像装置の製造方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、固体撮像装置およびその製造方法に係り、特に、監視カメラ、医療用カメラ、車載用カメラなどの半導体撮像素子を用いて形成される小型の固体撮像装置およびその製造方法に関するものである。
【０００２】
【従来の技術】近年、この種の撮像装置は、レンズなどの光学系を介して入力される画像を電気信号として出力するものである。そしてこの撮像装置の小型化、高性能化に伴い、カメラも小型化され、各方面で使用されてきており、映像の入力装置としての市場を広げている。
【０００４】従来の半導体撮像素子を用いた撮像装置は、レンズ、半導体撮像素子、その駆動回路および信号処理回路などを搭載したＬＳＩ等の部品を夫々筐体あるいは構造体に形成してこれらを組み合わせている。このような組み合わせによる実装構造は、従来、平板上のプリント基板上に各素子を搭載することによって形成され

ていた。

【０００５】そこで、装置の更なる小型化をはかるために、本出願人は、図６に示すように、実装部材として、矩形台状の脚部１０１Ａとその上に形成された胴部１０１Ｂとからなり、この脚部１０１Ａと胴部１０１Ｂとの境界部に開口部１０１Ｃを形成した、樹脂製の立体プリント基板１０１を提案している（特開2001－245186号）。そしてこの立体プリント基板１０１の、脚部１０１Ａの裏面側にプリント配線パターン１２２を形成するとともに、胴部１０１Ｂの内周には、レンズ１０２が嵌めこまれて、その光軸１１７を中心にして、開口部１０１Ｃの上側には光学フィルタ１０３、下側には半導体撮像素子１０４およびチップ部品（１０８）が配置されている。そして図７に断面図を示すようにこの脚部１０１Ａに配設された端子パターン１２２を介して、携帯電話、パソコン等の各種機器のメイン基板１１３にソルダペースト１１４を用いて接続されている。そしてこのメイン基板１１３には固体撮像素子の出力信号を処理する信号処理回路（ＤＳＰ）、および抵抗、コンデンサなどのチップ部品１１９等が多数形成されており、メイン基板１１３にフレキシブル回路基板（ＦＰＣ）１２０にボール端子列（ＢＧＡ）１２１を介して接続することにより、各部品間の接続が達成されるようになっている。図８はその要部説明図であるが、半導体撮像素子１０４は表面に形成されたバンプ１０６を介して脚部１０１Ａに形成された端子パターン１０５に接続され、封止樹脂１０７で封止されることによって立体プリント基板１０１との接続がなされている。同一部位には同一符号を付した。

【０００６】この図からもあきらかなように、多数の部品とこれらの相互接続が必要であるため、部品の実装に際し接続箇所が多く、装置が大型化するという問題があった。また実装に多大な時間を要するという問題もあった。

【０００７】また、実装に際しては、図９（ａ）乃至（ｃ）に示すように、立体プリント基板１０１を成型した後（図９（ａ））、固体撮像素子１０４を装着（図９（ｂ））し、この後、光学フィルタ１０３を装着する（図９（ｃ））という方法がとられている。

【０００８】このため、固体撮像素子１０４を立体プリント基板１０１に実装する際の加熱工程で、立体プリント基板１０１が大きく変形し、固体撮像素子１０４と、立体プリント基板１０１との接続部に極めて大きな応力がかかり、クラックなどによる接続不良が発生することがあった。

【０００９】このような立体プリント基板は、射出成型によって得られるが、成型精度の面からも、成型用金型の耐久性の面からも、樹脂材料の膨張係数を小さくするために通常用いられる耐湿顔料（フィラー）を一定量以上添加することができないという問題があった。

【００１０】さらに、一般的に射出成型で用いられる熱可塑性樹脂は直鎖状の分子結合構造をもつため、線膨張係数が、分子結合方向で小さく、その垂直方向では大きいという異方性を有している。また、成形流動方向にフィラーが配向しその垂直方向では大きいという異方性を有している。

【００１１】

【発明が解決しようとする課題】このように、従来の固体撮像装置は、信号処理回路をはじめ種々の機能部品を外付けで構成しており、実装に多大な時間を要する上、装置が大型化するという問題があった。さらにまた固体撮像素子と処理回路部品との間の接続部で接続不良が生じ、これが信頼性低下の原因となっていた。

【００１２】また、固体撮像素子を立体プリント基板に実装する際の加熱工程で、立体プリント基板が大きく変形し、固体撮像素子と、立体プリント基板との接続部に極めて大きな応力がかかり、クラックなどによる接続不良が発生することもあった。

【００１３】通常、この固体撮像素子と、立体プリント基板との接続部は、固体撮像素子に設けられたパッドと、立体プリント基板の端子電極とで構成され、これらの間の接続には、銀ペーストなどの導電性接着剤を用いた接続、超音波接合、熱圧着接合などが用いられる。

【００１４】いずれの方法によっても、立体プリント基板の熱変形により、固体撮像素子の接着剥離が生じ易く、これが歩留まり低下の原因となっている。

【００１５】このように、プリント基板を立体構造とすることにより、小型化が可能となる反面、熱による歪みは通常の平面構造の場合に比べて大きくなり、この膨張率の差による変形が歩留まり向上を阻む大きな問題となっていた。

【００１６】本発明は、前記実情に鑑みてなされたもので、周辺の接続回路を不要とし、製造工程の簡略化をはかるとともに小型でかつ信頼性の高い固体撮像装置を提供することを目的とする。また、立体プリント基板などの構造体の熱変形を抑制し、固体撮像素子の接続を確実にするとともに、固体撮像素子の接着品質の向上をはかることを目的とする。

【００１７】

【課題を解決するための手段】そこで本発明では、構造体の、固体撮像素子に接続され、前記固体撮像素子装着の装着される部分と前記透光性部材の装着される部分との間に配置せしめられるように形成された回路基板を一体的に封止した構造体を用い、この貫通開口部に固体撮像素子を装着するとともに、固体撮像素子から所定の間隔を隔てて貫通開口部を塞ぐように透光性部材を装着したことを特徴とするもので、構造体の成型時に回路基板を一体成型することにより、工数の低減をはかるとともに、装着部の構造の簡略化をはかり、装置の小型化を実現する。

【００１８】すなわち本発明では、絶縁性樹脂で構成され、貫通開口部を有する構造体と、前記貫通開口部を塞ぐように前記構造体に装着された固体撮像素子と、前記固体撮像素子から所定の間隔を隔てて前記貫通開口部を塞ぐように前記構造体に装着された透光性部材と、前記固体撮像素子に接続され、前記固体撮像素子の装着される部分と前記透光性部材の装着される部分との間に配置せしめられるように、前記構造体内に一体的に封止せしめられた回路基板とを具備したことを特徴とする。

【００１９】かかる構成によれば、熱変形の小さい回路基板が、固体撮像素子装着される部分と透光性部材装着される部分との間の光学スペースの厚さを利用して、（周縁部に）封入されており、外付け部品の大幅な低減を図ることが可能となり、装置の小型化が可能となる。また回路基板が構造体と一体成型されているため、固体撮像素子の装着時における構造体の熱変形は大幅に低減され、接続不良は大幅に低減される。

【００２０】望ましくは、前記回路基板は、前記固体撮像素子装着される部分にその一部が露呈せしめられた導体パターンを有する多層配線基板であり、前記固体撮像素子は前記回路基板の前記導体パターンにフェースダウンで直接接続されていることを特徴とする。

【００２１】かかる構成によれば、外部接続が低減され、かつフェースダウンにより小型化薄型化が可能となる。

【００２２】望ましくは、前記回路基板は、前記固体撮像素子の出力信号を処理する信号処理回路を含むことを特徴とするする。

【００２３】かかる構成によれば、回路基板が信号処理回路を含むため、外付けが不要となり、小型化をはかることができるとともに、信号処理回路が固体撮像素子に近接して形成され、処理時間が低減されるとともに、ノイズの低減を図ることが可能となる。

【００２４】また望ましくは、前記信号処理回路は前記回路基板の透光性基板装着側である第1の表面に接続されたチップ部品であることを特徴とする。

【００２５】かかる構成によれば、信号処理回路が多層配線基板上にチップ部品として搭載されるため、小型化をはかることができるとともに、信号処理回路が固体撮像素子に近接して形成され、処理時間が低減されるとともに、ノイズの低減を図ることが可能となる。

【００２６】また望ましくは、前記回路基板は、前記貫通開口部に相当する領域の一部を含み、前記貫通開口部に突出する透光性部材装着される部分をもつように貫通口を具備したリング状体で構成され、前記回路基板の前記透光性部材装着される部分に前記透光性部材が固着せしめられていることを特徴とする。

【００２７】かかる構成によれば、透光性部材は熱変形の少ない回路基板上に装着されるため、熱変形がより抑制される。

【００２８】また望ましくは、前記回路基板は、多層配線基板で構成され、前記固体撮像素子搭載面側にも導体パターンが露呈せしめられており、前記固体撮像素子が前記導体パターンに直接接続されていることを特徴とする。

【００２９】かかる構成によれば、接続が容易でより薄型化小型化を達成することが可能となる。

【００３０】望ましくは、前記構造体は、配線部が形成せしめられる脚部と、前記脚部上に設けられた筒状の胴部とを有し、前記貫通開口部は前記胴部と前記脚部との間に形成されていることを特徴とする。

【００３１】かかる構成によれば、特に、装置全体の構造を微細化することができるが、熱変形による接続部分の変形により、接続不良を生じ易いという問題がある。しかしながら本発明によれば、絶縁性樹脂よりも熱膨張係数が小さくかつ、熱変形の小さい回路基板を一体成型で装着した後に、固体撮像素子を装着することができ、絶縁性樹脂からなる構造体の熱変形を抑制し、固体撮像素子の接続の確実性を高めることができる。

【００３２】望ましくは、前記多層配線基板は前記脚部表面の一部に形成された導体パターンに電気的に接続されていることを特徴とする。

【００３３】かかる構成によれば、外部装置との接続が容易で、かつさらなる小型化をはかることが可能となる。

【００３４】望ましくは、前記多層配線基板は前記絶縁性樹脂よりも熱膨張率の小さい材料で構成されていることを特徴とする。

【００３５】かかる構成によれば、多層配線基板は、構造体を構成する樹脂よりも熱膨張率が小さいため、固体撮像素子実装時の熱による変形を低減し、信頼性を向上することが可能となる。

【００３６】望ましくは、前記透光性部材は、石英ガラス表面に多層構造の誘電体薄膜を形成してなることを特徴とする。

【００３７】かかる構成によれば、石英ガラスは、構造体を構成する樹脂よりも一桁程度熱膨張率が小さいため、固体撮像素子実装時の熱による変形を低減し、信頼性を向上することが可能となる。

【００３８】望ましくは、前記透光性部材は、熱硬化性樹脂からなることを特徴とする。

【００３９】かかる構成によれば、透光性部材として熱硬化性樹脂を用いることにより、固体撮像素子実装時の熱による変形を低減することができ、信頼性を向上することが可能となる。

【００４０】望ましくは、前記透光性部材は、光学フィルタであることを特徴とする。

【００４１】光学フィルタの装着位置は、固体撮像素子とさらに外側に装着されるレンズおよびの距離を決定することにもなり、装着位置は重要であるが、かかる構成

によれば、透光性部材が一体成型により固定されている上、熱膨張係数の小さい部材で構成されているため、その近傍で構造体の変形が抑制されるため、固体撮像素子近傍での構造体の熱変形を抑制し、固体撮像素子と光学フィルタの距離の確実性を高め、より優れた画像の取り込みが可能となる。

【００４２】望ましくは、前記回路基板は、透光性基板の表面にリング状をなすように形成された多層配線部からなり、前記透光性基板の中央部に位置する前記多層配線部から露呈する領域が、光学フィルタを構成していることを特徴とする。

【００４３】かかる構成によれば、透光性基板の中央部が光学フィルタを構成し、その外周部に多層配線部が形成され、回路基板と光学フィルタが同一基板で構成されているため、さらに部品点数が低減され、小型化薄型化が可能となる。また、実装工程がさらに低減されるため、実装作業性も向上する。

【００４４】また本発明の方法では、中央部に貫通口を有する絶縁性基板を用意し、配線層を形成し、回路基板を形成する配線基板形成工程と、前記回路基板の第1の表面上に信号処理回路チップを接続する工程と、前記信号処理回路チップの接続された回路基板を覆うとともに、前記貫通口に相当する領域に貫通開口部を形成するように絶縁性樹脂で封止し、構造体を形成する構造体成型工程と、前記回路基板の第２の表面に前記構造体の前記貫通開口部を塞ぐように固体撮像素子を装着する固体撮像素子装着工程と、前記回路基板の第1の表面に透光性部材を装着する透光性部材装着工程とを含むことを特徴とする。

【００４５】かかる構成によれば、熱変形の小さい回路基板上を構造体と一体成型しているため、固体撮像素子の装着時における構造体の熱変形は大幅に低減され、接続不良は大幅に低減される。また、透光性部材の装着工程が不要となり、生産性の向上をはかることができるとともに、装着に要するマージンも不要となり、装置の小型化をはかることが可能となる。

【００４６】望ましくは、前記構造体成型工程は、熱可塑性の絶縁性樹脂からなる構造体を、射出成型によって形成する射出成型工程であることを特徴とする

【００４７】構造体が、射出成型によって形成された熱可塑性樹脂で構成された場合、特に硬化時に変形が生じ易く、また、使用時にも高温環境になると、変形が生じ、固体撮像素子と、構造体（立体プリント基板）との接続部に接続不良が生じ易いという問題がある。しかしながら、かかる構成によれば、絶縁性樹脂よりも熱膨張係数が小さく熱変形の少ない回路基板により、絶縁性樹脂からなる構造体の熱変形を抑制し、固体撮像素子の接続の確実性を高めることができる。

【００４８】

【発明の実施の形態】以下、本発明の実施の形態について、図面を参照しつつ詳細に説明する。

【００４９】第１の実施の形態

本発明の第１の実施の形態の固体撮像装置の要部説明図を図１および図２に示す。この固体撮像装置は、固体撮像素子を搭載するための構造体１の成型に際し、熱膨張係数が構造体を構成する樹脂に比べて大幅に小さいセラミック基板２０をベースとして形成された回路基板である多層配線基板２を、多層配線基板２１の第1の面に形成された信号処理回路チップＤＳＰ２２とともに、絶縁性のポリフタルアミド樹脂で構成された構造体１内に封止してなることを特徴とするものである。そして、この構造体1は、貫通開口部１Ｃを具備し、この貫通開口部１Ｃを臨むように多層配線基板２の第1の面の信号処理回路チップＤＳＰ２２の内方に光学フィルタ３を構成する板状体を装着するとともに、多層配線基板２の第２の面に固体撮像素子４をフェースダウンで装着している。ここで光学フィルタ３は水晶屈折板で構成され、接着剤を介して周縁部で構造体１に固定されている。

【００５０】すなわち、この固体撮像装置は、絶縁性のポリフタルアミド樹脂で構成され、矩形台状の脚部１Ａとその上に形成された胴部１Ｂとからなり、この脚部１Ａと胴部１Ｂとの境界部に貫通開口部１Ｃを有すると共に、この貫通開口部１Ｃに内方の端縁を一部突出せしめられ、貫通口を有する多層配線基板２を、光学フィルタ３の装着される部分近傍に有し、脚部１Ａ表面の一部に端子パターン５を含む配線部を具備してなる構造体１と、この配線部に接続されると共に、この貫通開口部１Ｃに装着され、この端子パターン５にビアホール２７を介して電気的に接続された固体撮像素子４とを具備してなるものである。

【００５１】そしてまた、この多層配線基板２はセラミック基板２０の第1の面（表面）および第２の面（裏面）に銅配線パターン２１とポリイミド樹脂膜２４との多層膜を形成してなるもので、ポリイミド樹脂２４に形成されたビアホール２３を介して各層の銅配線パターン間が相互接続されるようになっている。また、この多層配線基板上には薄膜コンデンサ２５、薄膜抵抗２６などの素子も形成されている。

【００５２】次に、この固体撮像装置の製造方法について説明する。まず、図３（ａ）に示すように、セラミック基板２０の第1の面（表面）および第２の面（裏面）に銅薄膜を成膜し、ホトリソグラフィでパターニングして配線パターン２１を成膜形成したのちポリイミド樹脂膜２４を塗布し、ビアホール２３を形成しさらに、銅薄膜を成膜し、ホトリソグラフィでパターニングして配線パターン２１を成膜するという工程を繰り返し所望のパターンをもつ多層配線基板２を形成する。なお、このパターン形成工程の中で配線パターン間に抵抗体薄膜を挟むように積層して薄膜コンデンサを形成したり、配線パターン間に抵抗体薄膜を配置し、薄膜抵抗体を形成した

り、さらには必要に応じてチップ部品を接続する。

【００５３】さらに図３（ｂ）に示すように、この基板表面の配線パターン２１に形成されたバンプ２１Ｓに信号処理回路チップＤＳＰ２２を直接接続する。

【００５４】このようにして形成された多層配線基板２を成型金型内に装着し、図３（ｃ）に示すように、この成型金型内に形成されたキャビティ内にポリフタルアミド樹脂を射出したのち冷却し、硬化させることにより、矩形台状の脚部１Ａとその上に形成された胴部１Ｂとからなり、この脚部１Ａと胴部１Ｂとの境界部に貫通開口部１Ｃを有してなるポリフタルアミド樹脂製の構造体１を形成する。

【００５５】一方、水晶板の表面に所望の屈折率を有する多層構造の誘電体薄膜を蒸着し誘電体干渉フィルタからなる光学フィルタ３を形成する。そして図３（ｄ）に示すように、構造体1から貫通開口部１Ｃを臨むように露呈する多層配線基板２の第１の面に、光学フィルタ３を貼着する。

【００５６】そして、この構造体の所定の領域に、めっきプロセスあるいはスパッタリング法などの薄膜プロセスにより脚部１Ａの裏面側に形成された端子パターン５を含む配線部を形成する。

【００５７】続いて図３（ｅ）に示すように、構造体１の貫通開口部の一方の面に固体撮像素子（チップ）４を搭載する。ここで固体撮像素子４の接続電極にはバンプ６が形成されており、構造体１の脚部１Ａに形成された端子パターンの一端に熱圧着によって接続される。そして樹脂封止を行い、固体撮像素子４の表面を樹脂封止体７で被覆する。

【００５８】最後に、レンズ８を遮蔽ケース９で被覆し接着性樹脂１０によって構造体１に接続し図１および図２に示した固体撮像装置が形成される。

【００５９】このようにして形成された固体撮像装置では、ＤＳＰなどのチップ部品を搭載するとともに、薄膜抵抗、薄膜コンデンサなどを搭載した多層配線基板を絶縁性樹脂からなる構造体内に封止しているため、極めて小型でかつ製造が容易で信頼性の高いものとなっている。

【００６０】また固体撮像素子の実装に際し、絶縁性樹脂からなる構造体は内部に封止された多層配線基板で支持されているため、構造体に比べて熱膨張率が小さい、この多層配線基板が固定部材として作用し、構造体の熱変形を抑制するため、固体撮像素子の接続の確実性を高めることができる。

【００６１】また信号処理回路などの周辺回路部品の実装が不要となり、いわゆるハイブリッドＩＣとして光学フィルタと固体撮像素子の間に形成される光学スペースを利用して配置されるため、装置の大幅な小型化が可能となる。また、実装工程自体も不要となるため、実装工数が大幅に低減され、作業性が向上する。

【００６２】なお、この構造体は、射出成型によって得られるが、このポリフタルアミド樹脂は直鎖状の分子結合構造をもつため、熱膨張係数が、分子結合方向で小さく、その垂直方向では大きいという異方性を有している。そこでこの第１の実施の形態では、貫通開口部を囲むようにリング状の多層配線基板を封止したが、熱可塑性樹脂の射出方向に平行な方向に、貫通開口部を臨んで相対向する位置に、平行に２つの多層配線基板を封止するようにしても、分子結合方向に垂直な方向の伸びを抑制することが可能となる。

【００６３】なお上記第１の実施の形態では光学フィルタ埋め込み部の近傍に貫通孔を形成するなど、貫通開口部に開口するように固体撮像素子装着時のガスを排出するための孔を形成しておくのが望ましい。

【００６４】また、多層配線基板の形成に際しては基板あるいは絶縁膜へのビアホールの形成は、レーザ加工によって穴を形成し、スパッタリングあるいはめっき等を行うようにしてもよい。

【００６５】さらにまた、最後に構造体表面全体を、めっきし、この表面のめっき層と多層配線基板のグランド端子とを接続し電磁シールドを行うようにしてもよい。

【００６６】第２の実施の形態

本発明の第２の実施の形態の固体撮像装置の要部説明図を図５に示す。上記第１の実施の形態では、光学フィルタ３は多層配線基板に装着したが、この例では多層配線基板を構成するセラミック基板を透光性セラミックで構成し、表面に所望の膜を形成して多屈折材２０Ｓとしこれを光学フィルタとして用いたことを特徴とするものである。そして構造体内に封入する多層配線基板は、この多屈折材２０Ｓを絶縁性基板として用いて、貫通開口部１Ｃに相当する領域を除く周縁領域にリング状をなすように多層配線構造体２Ｍを形成し、この多層配線構造体２Ｍを、成型金型内に装着して射出成型することにより、配線構造体２Ｍの中心部をポリフタルアミド樹脂からなる構造体で封止したものである。製造に際しては、固体撮像素子４を搭載するための構造体１の成型に際し多数個の多層配線構造体２Ｍを一体形成してなる板状体を形成しこの板状体とともに多数個の構造体を一体成型し、後に個々の固体撮像装置にダイシングすることにより形成し得るようにしたことを特徴とするものである。

【００６７】さらにここでは固体撮像素子実装時に発生する、内部ガスを抜くことができるように、貫通開口部１Ｃに通じる貫通孔を光学フィルタとなる中心部に形成しておくのが望ましい。他部については、上記第１の実施の形態と同様に形成されている。

【００６８】製造に際しても上記第１の実施の形態と同様に形成されるが、この例では、光学フィルタのみならず、構造体も一体成型し、最後に図５に示すように、ダイシングラインｄ１、ｄ２、ｄ３…ｃ１、ｃ２、ｃ３…にしたがってダイシングし、図４に示したような固体撮

像装置を得る。

【００６９】また上記第１および第２の実施の形態では透光性部材として光学フィルタを用いたが光学フィルタに限定されることなく、透光性の封止部材、レンズなど適宜変形可能である。

【００７０】また、構造体を形成する樹脂についてはポリフタルアミド樹脂、ＰＰＳ樹脂などの熱可塑性樹脂の他、エポキシ樹脂などの熱硬化性樹脂も適用可能である。

【００７１】また、本発明の固体撮像装置は、カメラとして、光通信分野に限定されることなく、ＣＤ、ＤＶＤなどの読み取り素子、複写機の読み取り素子、医療機器あるいはドアホンなど、種々の光学機器への適用が可能である。

【００７２】

【発明の効果】以上説明したように本発明によれば、熱変形の小さい回路基板が、固体撮像素子装着される部分と透光性部材装着される部分との間の光学スペースの厚さを利用して、周縁部に封入されており、外付け部品の大幅な低減を図ることが可能となり、小型の固体撮像装置を提供できるものである。また回路基板が構造体と一体成型されているため、固体撮像素子の装着時における構造体の熱変形は大幅に低減され、接続不良は大幅に低減される固体撮像装置の製造方法を提供できるものである。

【図面の簡単な説明】

【図１】本発明の第１の実施の形態における固体撮像装置を示す断面図である。

【図２】本発明の第１の実施の形態の固体撮像装置を示す要部拡大断面図である。

【図３】本発明の第１の実施の形態における固体撮像装置の製造工程を示す図である。

【図４】本発明の第２の実施の形態における固体撮像装置を示す断面図である。

【図５】本発明の第２の実施の形態における固体撮像装置の製造工程を示す説明図である。

【図６】従来例の固体撮像装置を示す斜視図である。

【図７】従来例の固体撮像装置を示す断面図である。

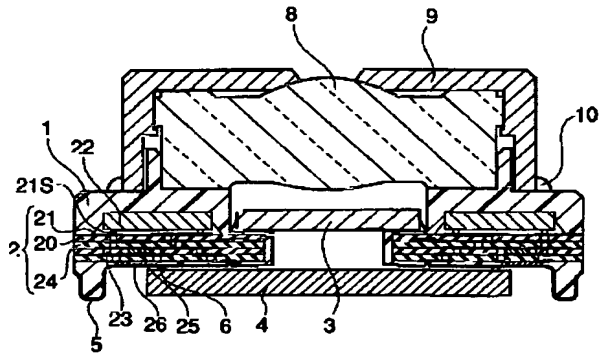
【図８】従来例の固体撮像装置を示す要部説明図である。

【図９】従来例の固体撮像装置の実装工程を示す要部説明図である。

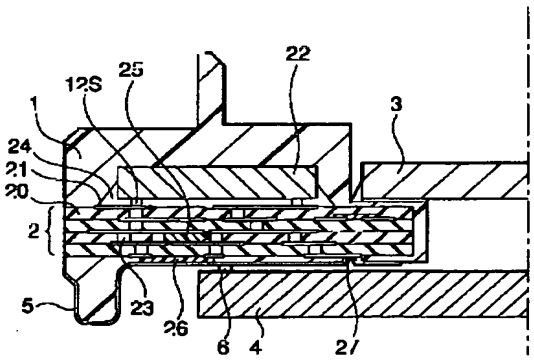
【符号の説明】

１　構造体
１Ａ　脚部
１Ｂ　胴部
１Ｃ　貫通開口部
２　多層配線基板（回路基板）
３　光学フィルタ
４　固体撮像素子
５　端子パターン
６　バンプ
７　封止樹脂
８　レンズ
９　遮蔽ケース
１０　接着性樹脂
２０　セラミック基板
２１　配線パターン
２２　信号処理回路チップ
２３　ビアホール
２４　ポリイミド樹脂膜
２５　薄膜コンデンサ
２６　薄膜抵抗

【図１】



【図２】



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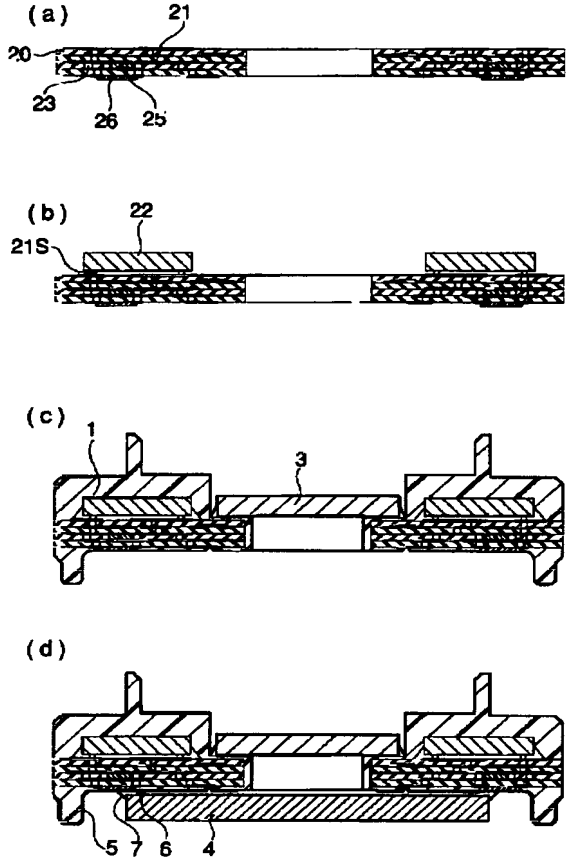

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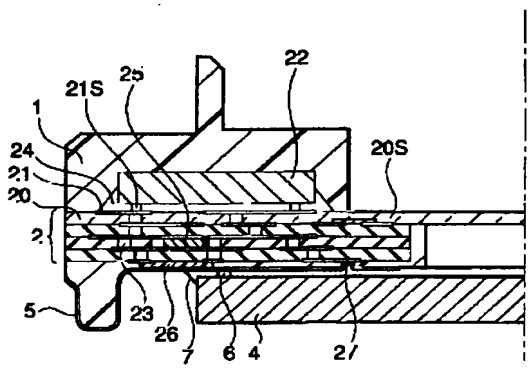

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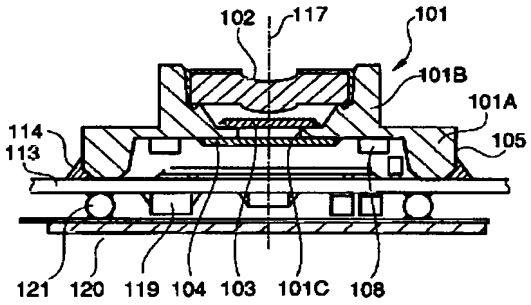

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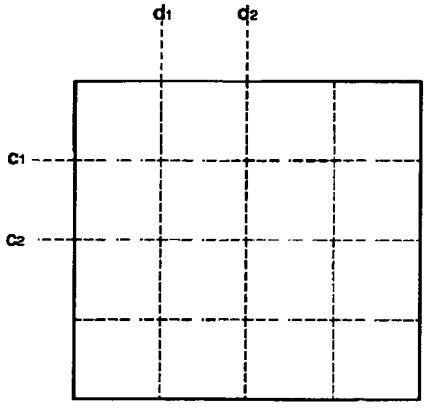

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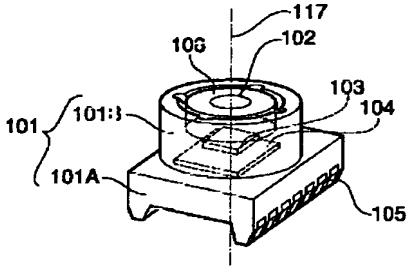

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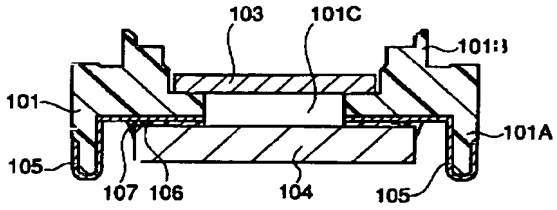

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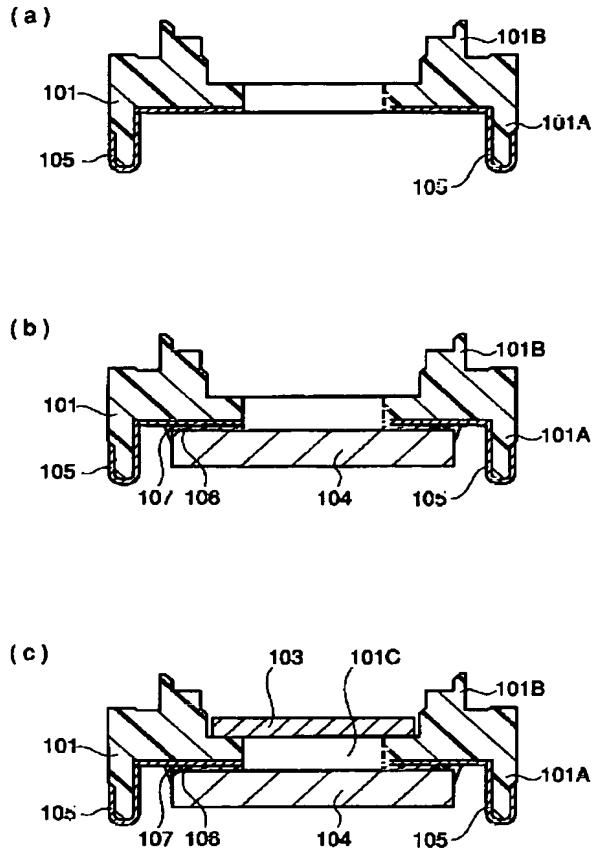

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to a solid state camera and its manufacture method, and relates to the small solid state camera especially formed using semiconductor image sensors, such as a surveillance camera, a camera for medical use, and a camera for mount, and its manufacture method.
[0002]
[Description of the Prior Art] In recent years, this kind of image pick-up equipment outputs the image inputted through the optical system of a lens etc. as an electrical signal. And with the miniaturization of this image pick-up equipment, and high-performance-izing, a camera is also miniaturized, it is used in every direction, and the commercial scene as an input unit of an image is extended.
[0004] The image pick-up equipment using the conventional semiconductor image sensor formed in a case or the structure components, such as LSI in which a lens, a semiconductor image sensor, its drive circuit, a digital disposal circuit, etc. were carried, respectively, and has combined these. The mounting structure by such combination was formed by carrying each element on the printed circuit board on a plate conventionally.
[0005] Then, in order to achieve the further miniaturization of equipment, as shown in drawing 6 , these people consisted of rectangle base-like leg 101A and drum section 101B formed on it as a mounting member, and have proposed the solid printed circuit board 101 made of resin which formed opening 101C in the boundary section of this leg 101A and drum section 101B (JP,2001-245186,A). And while forming the printed-circuit pattern 122 in the rear-face side of leg 101A of this solid printed circuit board 101, a lens 102 is inserted in the inner circumference of drum section 101B, and the semiconductor image sensor 104 and the chip (108) are arranged on opening 101C centering on that optical axis 117 at a light filter 103 and the bottom. And through the terminal pattern 122 arranged in this leg 101A as a cross section was shown in drawing 7 , solder paste 114 is used for the Maine substrate 113 of various devices, such as a cellular phone and a personal computer, and it connects with it. And many chip 119 grades, such as a digital disposal circuit (DSP) which processes the output signal of a solid state image sensor and resistance, and a capacitor, are formed in this Maine substrate 113, and connection between each part articles is attained by connecting with the Maine substrate 113 through the ball terminal train (BGA) 121 at the flexible circuit board (FPC) 120. Although drawing 8 is the important section explanatory drawing, the semiconductor image sensor 104 is connected to the terminal pattern 105 formed in leg 101A through the bump 106 formed in the surface, and connection with the solid printed circuit board 101 is made by carrying out the closure by closure resin 107. The same sign was given to the same part.
[0006] Since many components and these interconnect were required, there was a problem that there were many connection places and equipment was enlarged on the occasion of mounting of components, so that clearly also from this drawing. Moreover, there was also a problem that mounting took great time amount.
[0007] moreover, as shown in drawing 9 (a) thru/or (c), after casting the solid printed circuit board 101 on the occasion of mounting (drawing 9 (a)), it equips with a solid state image sensor 104 (drawing 9 (b)), and equips with a light filter 103 after this -- ** (drawing 9 (c)) -- the method of

saying is taken.
[0008] For this reason, the solid printed circuit board 101 might transform the solid state image sensor 104 greatly at the heating production process at the time of mounting in the solid printed circuit board 101, very big stress might be applied to the connection of a solid state image sensor 104 and the solid printed circuit board 101, and the faulty connection by a crack etc. might occur.
[0009] although such a solid printed circuit board is obtained by injection molding -- from the field of molding precision -- molding -- public funds -- also from the field of the endurance of a mold, in order to make the expansion coefficient of a resin material small, there was a problem that the moisture-proof pigment (filler) usually used could not be added more than a constant rate.
[0010] Furthermore, since the thermoplastics generally used by injection molding has straight chain-like molecular binding structure, it is small in the direction of molecular binding, and coefficient of linear expansion has the anisotropy of being large, if perpendicular. Moreover, in the shaping fluid direction, the filler has the anisotropy which is orientation Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. of being large, if perpendicular.
[0011]
[Problem(s) to be Solved by the Invention] Thus, when the conventional solid state camera constituted various functional parts including a digital disposal circuit from external and mounting took great time amount, there was a problem that equipment was enlarged. The faulty connection arose further again in the connection between a solid state image sensor and processing passive circuit elements, and this caused a reliability fall.
[0012] Moreover, the solid printed circuit board might transform the solid state image sensor greatly at the heating production process at the time of mounting in a solid printed circuit board, very big stress might be applied to the connection of a solid state image sensor and a solid printed circuit board, and the faulty connection by a crack etc. might occur.
[0013] Usually, the connection of this solid state image sensor and a solid printed circuit board consists of a pad prepared in the solid state image sensor, and a terminal electrode of a solid printed circuit board, and the connection which used electroconductive glue, such as a silver paste, ultrasonic jointing, thermocompression bonding cementation, etc. are used for connection between these.
[0014] By heat deformation of a solid printed circuit board, it is easy to produce adhesion exfoliation of a solid state image sensor by any method, and this causes a yield fall.
[0015] Thus, while the miniaturization became possible by making a printed circuit board into a spacial configuration, the distortion by heat became large compared with the case of the usual planar structure, and had become the big problem on which deformation by the difference of this expansion coefficient obstructs the improvement in the yield.
[0016] This invention was made in view of said actual condition, makes a surrounding connection circuit unnecessary, and it aims at offering a small and reliable solid state camera while it achieves simplification of a manufacturing process. Moreover, while controlling heat deformation of the structures, such as a solid printed circuit board, and ensuring connection of a solid state image sensor, it aims at aiming at improvement in the adhesion quality of a solid state image sensor.
[0017]
[Means for Solving the Problem] So, in this invention, connect with a solid state image sensor of the structure, and the structure which closed in one the circuit board formed so that it might be made to arrange between a portion equipped with said solid state image sensor wearing and a portion equipped with said translucency member is used. It is what is characterized by equipping with a translucency member so that a predetermined gap may be separated from a solid state image sensor and penetration opening may be plugged up, while equipping this penetration opening with a solid state image sensor. While aiming at reduction of a man day by really casting the circuit board at the time of molding of the structure, a miniaturization of a scale and equipment is realized for simplification of structure of an applied part.
[0018] Namely, the structure which is constituted from this invention by insulating resin and has penetration opening, A solid state image sensor with which said structure was equipped so that said penetration opening might be plugged up, A translucency member with which said structure was equipped so that a predetermined gap might be separated from said solid state image sensor and said

penetration opening might be plugged up, It is characterized by providing the circuit board you were made to close in one in said structure so that it may connect with said solid state image sensor and may be made to arrange between a portion equipped with said solid state image sensor, and a portion equipped with said translucency member.

[0019] According to this configuration, using thickness of an optical space between a portion by which solid state image sensor wearing is carried out, and a portion by which translucency member wearing is carried out, it is enclosed (in periphery section), and the small circuit board of heat deformation becomes possible [aiming at sharp reduction of external components], and a miniaturization of equipment of it is attained. Moreover, since the circuit board is the structure and really cast, heat deformation of the structure at the time of wearing of a solid state image sensor is reduced sharply, and a faulty connection is reduced sharply.

[0020] Desirably, said circuit board is a multilayer-interconnection substrate which has a conductor pattern the part was made to expose by said portion by which solid state image sensor wearing is carried out, and it is characterized by carrying out direct continuation of said solid state image sensor to said conductor pattern of said circuit board by face down.

[0021] According to this configuration, external connection is reduced and miniaturization thin shape-ization is attained by face down.

[0022] said circuit board contains desirably a digital disposal circuit which processes an output signal of said solid state image sensor -- the feature -- smoothly .

[0023] Since the circuit board contains a digital disposal circuit, while according to this configuration external becomes unnecessary and can achieve a miniaturization, a digital disposal circuit approaches a solid state image sensor, and is formed, and while the processing time is reduced, it becomes possible to aim at reduction of a noise.

[0024] Moreover, said digital disposal circuit is desirably characterized by being the chip connected to the 1st surface which is a translucency substrate wearing side of said circuit board.

[0025] According to this configuration, since a digital disposal circuit is carried as a chip on a multilayer-interconnection substrate, while being able to achieve a miniaturization, a digital disposal circuit approaches a solid state image sensor, and is formed, and while the processing time is reduced, it becomes possible to aim at reduction of a noise.

[0026] Moreover, desirably, said circuit board consists of ring-like objects possessing penetration opening so that it may have the portion which projects in said penetration opening and by which translucency member wearing is carried out including a part of field equivalent to said penetration opening, and it is characterized by said translucency member being made to fix by said portion of said circuit board by which translucency member wearing is carried out.

[0027] According to this configuration, since it is equipped with a translucency member on the circuit board with little heat deformation, heat deformation is controlled more.

[0028] Moreover, said circuit board is desirably characterized by consisting of multilayer-interconnection substrates, and for a conductor pattern being made to expose by said solid state image sensor loading side side, and carrying out direct continuation of said solid state image sensor to said conductor pattern.

[0029] According to this configuration, connection becomes it is easy and possible [attaining a thin shape-ized miniaturization more].

[0030] Desirably, said structure has the leg the wiring section is made to form, and a tubed drum section prepared on said leg, and it is characterized by forming said penetration opening between said drum sections and said legs.

[0031] According to this configuration, although structure of the whole equipment can be especially made detailed, there is a problem of being easy to produce a faulty connection, according to deformation for a connection by heat deformation. However, according to this invention, after really equipping with the circuit board with a small and coefficient of thermal expansion and heat deformation smaller than insulating resin by molding, it can equip with a solid state image sensor, heat deformation of the structure which consists of insulating resin can be controlled, and the certainty of connection of a solid state image sensor can be raised.

[0032] Desirably, it is characterized by connecting said multilayer-interconnection substrate to a conductor pattern formed in said a part of leg surface electrically.

[0033] According to this configuration, connection with an external device becomes it is easy and possible [achieving the further miniaturization].
[0034] Desirably, it is characterized by said multilayer-interconnection substrate consisting of materials with a coefficient of thermal expansion smaller than said insulating resin.
[0035] According to this configuration, since coefficient of thermal expansion is smaller than resin which constitutes the structure, a multilayer-interconnection substrate reduces deformation by heat at the time of solid state image sensor mounting, and becomes possible [improving reliability].
[0036] Desirably, it is characterized by said translucency member coming to form a dielectric thin film of multilayer structure in the quartz-glass surface.
[0037] According to this configuration, since coefficient of thermal expansion is small about single figure, quartz glass reduces deformation by heat at the time of solid state image sensor mounting, and becomes possible [improving reliability] from resin which constitutes the structure.
[0038] Desirably, said translucency member is characterized by consisting of thermosetting resin.
[0039] According to this configuration, by using thermosetting resin as a translucency member, deformation by heat at the time of solid state image sensor mounting can be reduced, and it becomes possible to improve reliability.
[0040] Desirably, said translucency member is characterized by being a light filter.
[0041] a lens with which it is further equipped with a stowed position of a light filter outside with a solid state image sensor, although it is also determining distance to call and a stowed position is important Since according to this configuration it consists of members with a small coefficient of thermal expansion when a translucency member is really being fixed by molding, Since deformation of the structure is controlled in the near, heat deformation of the structure near the solid state image sensor is controlled, the certainty of distance of a solid state image sensor and a light filter is raised, and incorporation of a more excellent image becomes possible.
[0042] Desirably, said circuit board consists of the multilayer-interconnection section formed so that the shape of a ring might be made on the surface of a translucency substrate, and a field exposed from said multilayer-interconnection section located in a center section of said translucency substrate is characterized by constituting a light filter.
[0043] Since according to this configuration a center section of a translucency substrate constitutes a light filter, the multilayer-interconnection section is formed in the periphery section and the circuit board and a light filter consist of same substrates, components mark are reduced further and miniaturization thin shape-ization is attained. Moreover, since a mounting production process is reduced further, mounting workability also improves.
[0044] Moreover, a wiring substrate formation production process which prepares for a center section an insulating substrate which has penetration opening by method of this invention, forms a wiring layer, and forms the circuit board, A production process which connects a digital-disposal-circuit chip on the 1st [of said circuit board] surface, and the circuit board to which said digital-disposal-circuit chip was connected with a wrap A structure molding production process which closes by insulating resin so that penetration opening may be formed in a field equivalent to said penetration opening, and forms the structure, It is characterized by including a solid state image sensor wearing production process of equipping with a solid state image sensor so that said penetration opening of said structure may be plugged up on the 2nd surface of said circuit board, and a translucency member wearing production process of equipping the 1st surface of said circuit board with a translucency member.
[0045] According to this configuration, since a small circuit board top of heat deformation is the structure and really cast, heat deformation of the structure at the time of wearing of a solid state image sensor is reduced sharply, and a faulty connection is reduced sharply. Moreover, while a wearing production process of a translucency member becomes unnecessary and being able to aim at improvement in productivity, a margin which wearing takes also becomes unnecessary and becomes possible [achieving a miniaturization of equipment].
[0046] Desirably, said structure molding production process is [0047] characterized by being the injection molding production process which forms the structure which consists of thermoplastic insulating resin by injection molding. When the structure consists of thermoplastics formed of injection molding, and it is easy to produce deformation especially at the time of hardening and

becomes hot environments also at the time of use, there is a problem of deformation arising and being easy to produce a faulty connection in a connection of a solid state image sensor and the structure (solid printed circuit board). However, according to this configuration, rather than insulating resin, a coefficient of thermal expansion can control heat deformation of the structure which consists of insulating resin by the small circuit board with little heat deformation, and the certainty of connection of a solid state image sensor can be raised.

[0048]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to details, referring to a drawing.

[0049] Important section explanatory drawing of the solid state camera of the gestalt of operation of the 1st of gestalt this invention of the 1st operation is shown in drawing 1 and drawing 2 . It is characterized by this solid state camera coming to close the multilayer-interconnection substrate 2 which is the circuit board formed considering the sharply small ceramic substrate 20 as the base compared with the resin with which a coefficient of thermal expansion constitutes the structure in the structure 1 which consisted of insulating poly phthalamide resin with the digital-disposal-circuit chip DSP 22 formed in the 1st field of the multilayer-interconnection substrate 21 on the occasion of molding of the structure 1 for carrying a solid state image sensor. And this structure 1 possessed penetration opening 1C, and it has equipped the 2nd field of the multilayer-interconnection substrate 2 with the solid state image sensor 4 by the face down while it equips a way with the plate which constitutes a light filter 3 among the digital-disposal-circuit chips DSP 22 of the 1st field of the multilayer-interconnection substrate 2 so that this penetration opening 1C may be faced. A light filter 3 consists of Xtal refraction boards, and is being fixed to the structure 1 in the periphery section through adhesives here.

[0050] Namely, while this solid state camera consists of insulating poly phthalamide resin, consists of rectangle base-like leg 1A and drum section 1B formed on it and having penetration opening 1C in the boundary section of this leg 1A and drum section 1B The structure 1 which comes to provide the wiring section which can project a part of edge of the method of inside to this penetration opening 1C, is closed to it, has near [where a light filter 3 is equipped with the multilayer-interconnection substrate 2 which has penetration opening] the portion, and contains the terminal pattern 5 in a part of leg 1A surface, While connecting with this wiring section, this penetration opening 1C is equipped and it comes to provide the solid state image sensor 4 electrically connected to this terminal pattern 5 through the beer hall 27.

[0051] And between the copper circuit patterns of each class interconnects again through the beer hall 23 which this multilayer-interconnection substrate 2 comes to form the multilayers of the copper circuit pattern 21 and the polyimide resin film 24 in the 1st field (surface) and 2nd field (rear face) of a ceramic substrate 20, and was formed in polyimide resin 24. Moreover, on this multilayer-interconnection substrate, elements, such as a thin film capacitor 25 and a thin film resistor 26, are also formed.

[0052] Next, the manufacture method of this solid state camera is explained. First, as shown in drawing 3 (a), after forming a copper thin film to the 1st field (surface) and 2nd field (rear face) of a ceramic substrate 20, carrying out patterning with phot lithography and carrying out membrane formation formation of the circuit pattern 21, the polyimide resin film 24 is applied, a beer hall 23 is formed, and the multilayer-interconnection substrate 2 which has the pattern of a repeat request for the production process of forming a copper thin film, carrying out patterning with phot lithography and forming a circuit pattern 21 is formed further. In addition, a laminating is carried out, a thin film capacitor is formed, or a resistor thin film is arranged between circuit patterns so that a resistor thin film may be pinched between circuit patterns in this pattern formation production process, a thin film resistor is formed or a chip is connected further if needed.

[0053] As furthermore shown in drawing 3 (b), direct continuation of the digital-disposal-circuit chip DSP 22 is carried out to bump 21S formed in the circuit pattern 21 on this surface of a substrate.

[0054] Thus, as it equips with the formed multilayer-interconnection substrate 2 in molding metal mold and is shown in drawing 3 (c) By cooling, after injecting poly phthalamide resin in the cavity formed in this molding metal mold, and making it harden It consists of rectangle base-like leg 1A and drum section 1B formed on it, and the structure 1 made of poly phthalamide resin which comes

to have penetration opening 1C is formed in the boundary section of this leg 1A and drum section 1B.

[0055] The light filter 3 which, on the other hand, vapor-deposits the dielectric thin film of the multilayer structure which has a desired refractive index on the surface of a quartz plate, and consists of a dielectric interference filter is formed. And as shown in drawing 3 (d), a light filter 3 is stuck on the 1st field of the multilayer-interconnection substrate 2 exposed so that penetration opening 1C may be faced from the structure 1.

[0056] And the wiring section containing the terminal pattern 5 formed in the rear-face side of leg 1A of thin film processes, such as a plating process or the sputtering method, is formed in the predetermined field of this structure.

[0057] Then, as shown in drawing 3 (e), a solid state image sensor (chip) 4 is carried in one field of the penetration opening of the structure 1. The bump 6 is formed in the connection electrode of a solid state image sensor 4 here, and thermocompression bonding connects with the end of the terminal pattern formed in leg 1A of the structure 1. And a resin seal is performed and the surface of a solid state image sensor 4 is covered with the resin seal object 7.

[0058] The solid state camera which covered the lens 8 with the electric shielding case 9, finally connected to the structure 1 with adhesive resin 10, and was shown in drawing 1 and drawing 2 is formed.

[0059] Thus, in the formed solid state camera, since the multilayer-interconnection substrate carrying a thin film resistor, a thin film capacitor, etc. is closed in the structure which consists of insulating resin while carrying chips, such as DSP, it is very small, and manufacture is easy and has become what has high reliability.

[0060] Moreover, since this multilayer-interconnection substrate with a small coefficient of thermal expansion acts as a holddown member compared with the structure since it is supported with the multilayer-interconnection substrate by which the closure was carried out to the interior, and the structure which consists of insulating resin on the occasion of mounting of a solid state image sensor controls heat deformation of the structure, it can raise the certainty of connection of a solid state image sensor.

[0061] Moreover, mounting of circumference passive circuit elements, such as a digital disposal circuit, becomes unnecessary, and since it is arranged using the optical space formed between a light filter and a solid state image sensor as the so-called hybrid IC, the large miniaturization of equipment is attained. Moreover, since the mounting production process itself becomes unnecessary, a mounting man day is reduced sharply and its workability improves.

[0062] In addition, although this structure is obtained by injection molding, since this poly phthalamide resin has straight chain-like molecular binding structure, it is small in the direction of molecular binding, and the coefficient of thermal expansion has that anisotropy of being large, if perpendicular. Then, with the gestalt of this 1st operation, the ring-like multilayer-interconnection substrate was closed so that penetration opening might be surrounded, but even if it closes two multilayer-interconnection substrates in parallel in the location which faces penetration opening in the direction parallel to the injection direction of thermoplastics, and carries out phase opposite, it becomes possible to control the elongation of a direction perpendicular to the direction of molecular binding.

[0063] In addition, as for forming the hole for discharging the gas at the time of solid state image sensor wearing so that a opening may be carried out to penetration opening, it is desirable to form a through tube near the light filter embedding section with the gestalt of implementation of the above 1st etc.

[0064] Moreover, on the occasion of formation of a multilayer-interconnection substrate, formation of the beer hall to a substrate or an insulator layer forms a hole, and may be made to perform sputtering or plating by laser beam machining.

[0065] Finally, the whole structure surface is galvanized, the plating layer of this surface and the grand terminal of a multilayer-interconnection substrate are connected further again, and it may be made to perform electromagnetic shielding.

[0066] Important section explanatory drawing of the solid state camera of the gestalt of operation of the 2nd of gestalt this invention of the 2nd operation is shown in drawing 5 . With the gestalt of

implementation of the above 1st, although the multilayer-interconnection substrate was equipped with the light filter 3, it is characterized by having constituted the ceramic substrate which constitutes a multilayer-interconnection substrate from this example from a translucency ceramic, having formed the desired film in the surface, having been referred to as multi-refraction material 20S, and using this as a light filter. And the multilayer-interconnection substrate enclosed in the structure closes the core of wiring structure 2M by the structure which consists of poly phthalamide resin by forming multilayer-interconnection structure 2M so that the shape of a ring may be made to the periphery field except the field equivalent to penetration opening 1C, using this multi-refraction material 20S as an insulating substrate, equipping with these multilayer-interconnection structure 2M in molding metal mold, and carrying out injection molding. It is characterized by forming the plate which really comes to form many multilayer-interconnection structure 2M on the occasion of molding of the structure 1 for carrying a solid state image sensor 4 on the occasion of manufacture, and enabling it to form by really casting many structures with this plate, and carrying out dicing to each solid state camera behind.

[0067] It is desirable to form in the core used as a light filter the through tube which leads to penetration opening 1C so that the internal gas which furthermore occurs here at the time of solid state image sensor mounting can be extracted. About the other sections, it is formed like the gestalt of implementation of the above 1st.

[0068] Although it is formed like the gestalt of implementation of the above 1st even if it faces manufacture, as not only a light filter but the structure is really cast by this example and it is finally shown in drawing 5 in it, they are the dicing lines d1, d2, and d3. -- Dicing is carried out according to c1, c2, and c3 --, and a solid state camera as shown in drawing 4 is obtained.

[0069] Moreover, the closure member of translucency, a lens, etc. are deformable suitably, without being limited to a light filter, although the light filter was used as a translucency member with the gestalt of the above 1st and the 2nd implementation.

[0070] Moreover, about the resin which forms the structure, thermosetting resin, such as an epoxy resin besides thermoplastics, such as poly phthalamide resin and PPS resin, is also applicable.

[0071] Moreover, application to various optical instruments, such as reading elements, such as CD and DVD, a reading element of a copying machine, medical equipment, or an intercom, is possible for the solid state camera of this invention as a camera, without being limited to the optical-communication field.

[0072]

[Effect of the Invention] As explained above, according to this invention, the small circuit board of heat deformation is enclosed with the periphery section using the thickness of the optical space between the portion by which solid state image sensor wearing is carried out, and the portion by which translucency member wearing is carried out, it becomes possible to aim at sharp reduction of external components, and a small solid state camera can be offered. Moreover, since the circuit board is the structure and really cast, heat deformation of the structure at the time of wearing of a solid state image sensor is reduced sharply, and a faulty connection can offer the manufacture method of the solid state camera reduced sharply.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section showing the solid state camera in the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the important section expanded sectional view showing the solid state camera of the gestalt of operation of the 1st of this invention.
[Drawing 3] It is drawing showing the manufacturing process of the solid state camera in the gestalt of operation of the 1st of this invention.
[Drawing 4] It is the cross section showing the solid state camera in the gestalt of operation of the 2nd of this invention.
[Drawing 5] It is explanatory drawing showing the manufacturing process of the solid state camera in the gestalt of operation of the 2nd of this invention.
[Drawing 6] It is the perspective diagram showing the solid state camera of the conventional example.
[Drawing 7] It is the cross section showing the solid state camera of the conventional example.
[Drawing 8] It is important section explanatory drawing showing the solid state camera of the conventional example.
[Drawing 9] It is important section explanatory drawing showing the mounting production process of the solid state camera of the conventional example.
[Description of Notations]
1 Structure
1A Leg
1B Drum section
1C Penetration opening
2 Multilayer-Interconnection Substrate (Circuit Board)
3 Light Filter
4 Solid State Image Sensor
5 Terminal Pattern
6 Bump
7 Closure Resin
8 Lens
9 Electric Shielding Case
10 Adhesive Resin
20 Ceramic Substrate
21 Circuit Pattern
22 Digital-Disposal-Circuit Chip
23 Beer Hall
24 Polyimide Resin Film
25 Thin Film Capacitor
26 Thin Film Resistor

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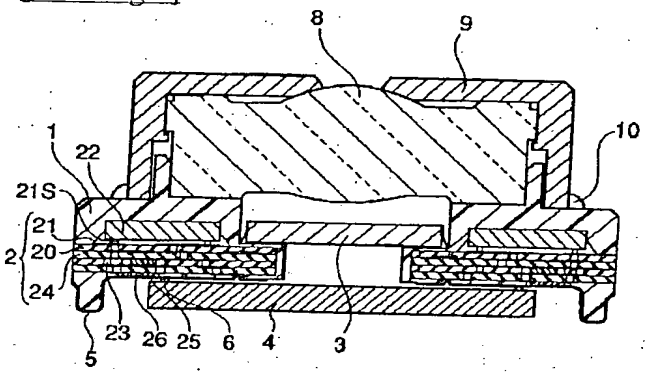
DRAWINGS

[Drawing 1]



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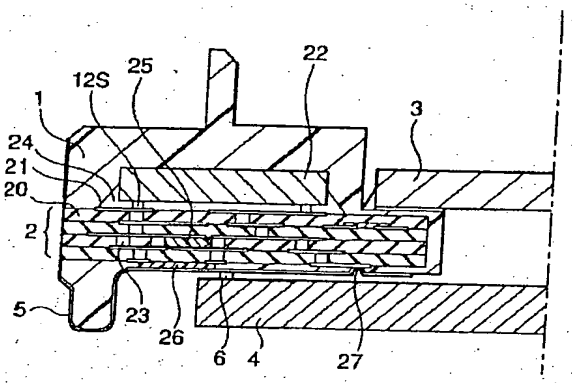
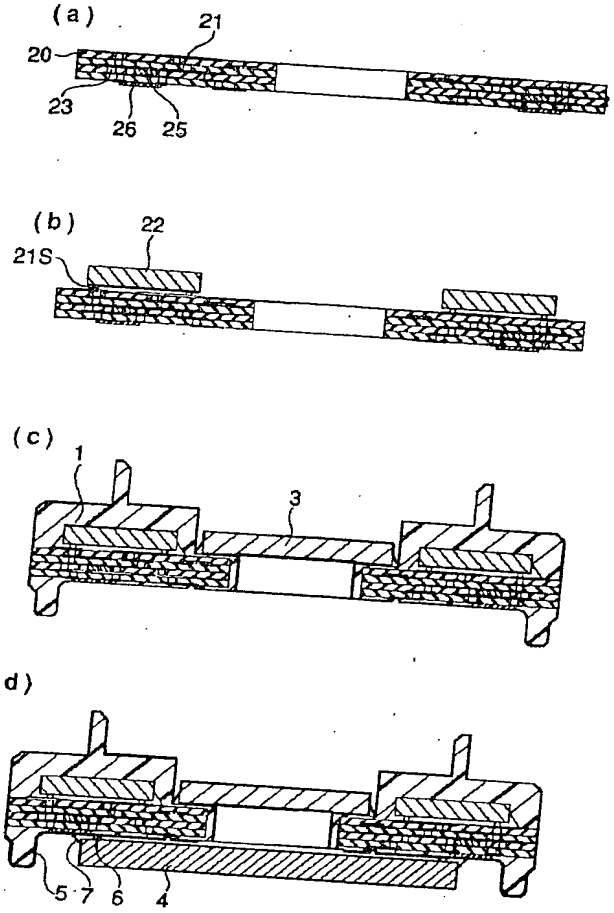


[Drawing 3]



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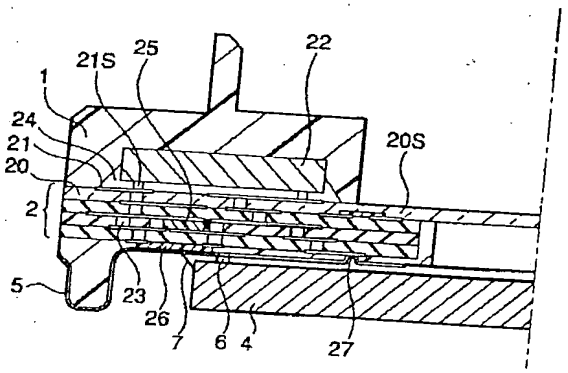

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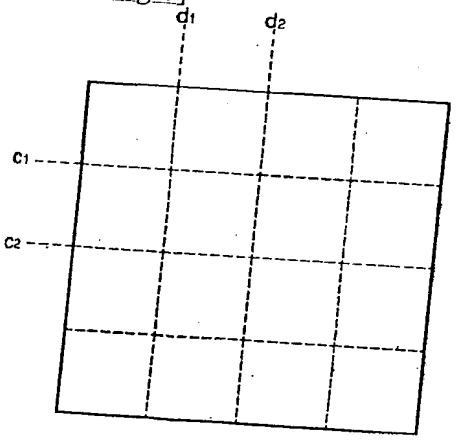

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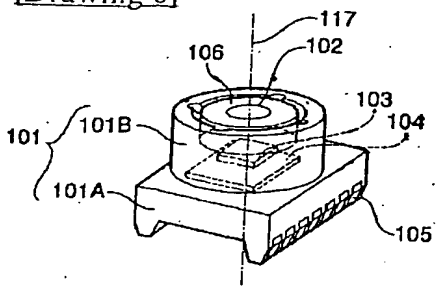
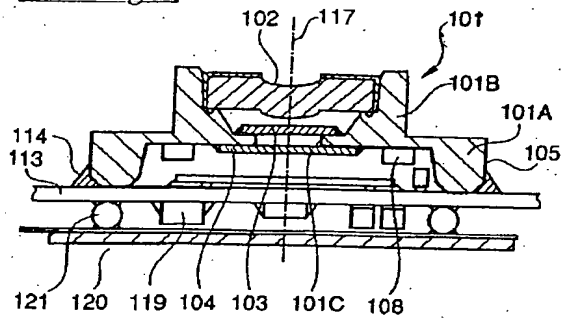
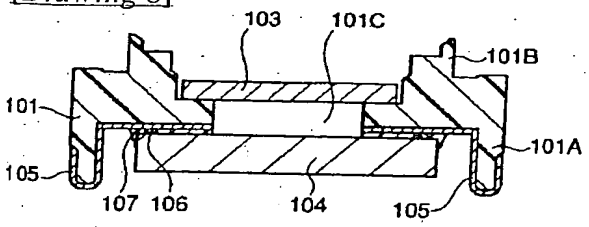


[Drawing 7]

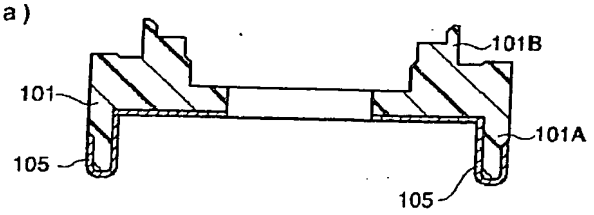


[Drawing 8]

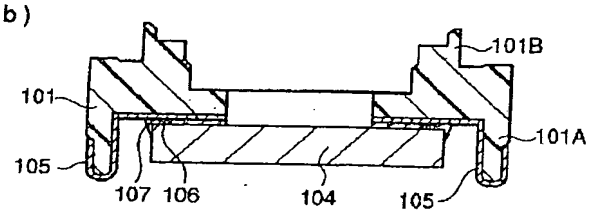


[Drawing 9]

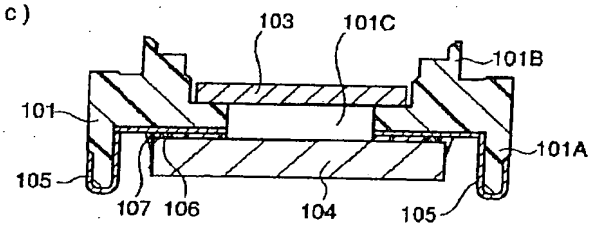
(a)



(b)



(c)



[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] A solid state camera characterized by providing the following. The structure which consists of insulating resin and has penetration opening A solid state image sensor with which said structure was equipped so that said penetration opening might be plugged up A translucency member with which said structure was equipped so that a predetermined gap might be separated from said solid state image sensor and said penetration opening might be plugged up The circuit board you were made to close in one so that it may connect with said solid state image sensor and may be made to arrange between a portion equipped with said solid state image sensor of said structure, and a portion equipped with said translucency member in said structure
[Claim 2] It is the solid state camera according to claim 1 characterized by for said circuit board being a multilayer-interconnection substrate which has a conductor pattern the part was made to expose by portion equipped with said solid state image sensor, and carrying out direct continuation of said solid state image sensor to said conductor pattern of said circuit board by face down.
[Claim 3] Said circuit board is a solid state camera given in either of claims 1 or 2 characterized by including a digital disposal circuit which processes an output signal of said solid state image sensor.
[Claim 4] Said digital disposal circuit is a solid state camera according to claim 3 characterized by being the chip connected to the 1st surface which is a translucency substrate wearing side of said circuit board.
[Claim 5] Said circuit board is a solid state camera according to claim 1 to 4 characterized by said translucency member being made to fix by portion which it consists of ring-like objects possessing penetration opening so that it may have the portion which projects in said penetration opening, and by which translucency member wearing is carried out including a part of field equivalent to said penetration opening, and is equipped with said translucency member of said circuit board.
[Claim 6] Said circuit board is a solid state camera according to claim 1 to 5 characterized by consisting of multilayer-interconnection substrates, and for a conductor pattern being made to expose by said solid state image sensor loading side side, and carrying out direct continuation of said solid state image sensor to said conductor pattern.
[Claim 7] It is the solid state camera according to claim 1 to 6 which said structure has the leg and a tubed drum section prepared on said leg, and is characterized by being made to arrange said penetration opening between said drum sections and said legs.
[Claim 8] Said multilayer-interconnection substrate is a solid state camera according to claim 7 characterized by connecting with a conductor pattern formed in said a part of leg surface electrically.

[Claim 9] Said multilayer-interconnection substrate is a solid state camera according to claim 7 characterized by consisting of materials with a coefficient of thermal expansion smaller than said insulating resin.
[Claim 10] Said translucency member is a solid state camera according to claim 1 to 9 characterized by coming to form a dielectric thin film of multilayer structure in the quartz-glass surface.
[Claim 11] Said translucency member is a solid state camera according to claim 1 to 9 characterized by consisting of thermosetting resin.
[Claim 12] Said translucency member is a solid state camera according to claim 1 to 11 characterized by being a light filter.

[Claim 13] Said circuit board is a solid state camera according to claim 12 with which a field exposed from said multilayer-interconnection section which consists of the multilayer-interconnection section formed so that the shape of a ring might be made on the surface of a translucency substrate, and is located in a center section of said translucency substrate is characterized by constituting a light filter.

[Claim 14] A manufacture method of a solid state camera characterized by providing the following A wiring substrate formation production process which prepares for a center section an insulating substrate which has penetration opening, forms a wiring layer in it, and forms the circuit board in it A production process which connects a digital-disposal-circuit chip on the 1st [of said circuit board] surface A structure molding production process which closes by insulating resin so that penetration opening may be formed in a field which is equivalent to said penetration opening with a wrap in the circuit board to which said digital-disposal-circuit chip was connected, and forms the structure A solid state image sensor wearing production process of equipping with a solid state image sensor so that said penetration opening of said structure may be plugged up on the 2nd surface of said circuit board, and a translucency member wearing production process of equipping the 1st surface of said circuit board with a translucency member

[Claim 15] Said structure molding production process is the manufacture method of a solid state camera according to claim 14 characterized by being the injection molding production process which forms the structure which consists of thermoplastic insulating resin by injection molding.

[Translation done.]

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(19) JAPANESE PATENT OFFICE

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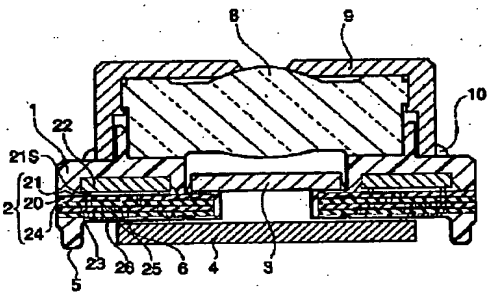
(54) SOLID STATE IMAGE PICKUP DEVICE AND ITS MANUFACTURING METHOD

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a small-sized solid state image pickup device of high reliability wherein a peripheral connection circuit is unnecessary and manufacturing processes are simple, connection quality of a solid state image pickup element is improved by restraining thermal transformation of a structure like a three-dimensional printed board and ensuring connection of the solid state image pickup element, the whole device is miniaturized, and manufacturing processes are simplified.

SOLUTION: In this solid state image pickup device, the structure 1 is used which integrally seals a circuit board 2 which is connected with a solid state image pickup element 4 and formed so as to be arranged on a part between a part on which the solid state image pickup element 4 is to be attached and a part on which a translucent member 3 is to be attached. The solid state image pickup element 4 is attached to a penetrating aperture part 1C of the structure 1, and the translucent member is attached so as to close the penetrating aperture part 1C being isolated by a prescribed distance from the solid state image pickup element 4. As a result, the number of manufacturing processes is reduced, structure of the parts to be attached is simplified and miniaturization of the device is realized, by integrally molding the circuit board 2 with the structure.



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